97-84131-27

Dublin, Louis Israel

The build of women and its relation to their mortality

New York

1938

97-84131-27
MASTER NEGATIVE #

COLUMBIA UNIVERSITY LIBRARIES
PRESERVATION DIVISION

BIBLIOGRAPHIC MICROFORM TARGET

ORIGINAL MATERIAL AS FILMED - EXISTING BIBLIOGRAPHIC RECORD

308
Z
Box 509
Dublin, Louis Israel, 1882-
The build of women and its relation to their mortality; a preliminary report, by Louis I. Dublin ... and Herbert H. Marks ... New York, Recording & statistical corporation, 1938.
32 p. incl. tables. 23cm.
ANOTHER COPY IN MEDICAL LIBRARY
Cover-title.
"Read at the forty-eighth Annual meeting of the Association of life insurance medical directors of America, October 28-29, 1937."

22371

(~~Continued on next card~~)
JP c84

RESTRICTIONS ON USE: *Reproductions may not be made without permission from Columbia University Libraries.*

TECHNICAL MICROFORM DATA

FILM SIZE: 35mm
REDUCTION RATIO: 11:1
IMAGE PLACEMENT: IA [✓ IIA] IB IIB

DATE FILMED: 7/7/97
INITIALS: TLM/PB

TRACKING # : 25717

FILMED BY PRESERVATION RESOURCES, BETHLEHEM, PA.

The Build of Women and Its Relation to Their Mortality

A PRELIMINARY REPORT

by

Louis I. Dublin, Ph. D., Third Vice President and
Statistician, and Herbert H. Marks
Metropolitan Life Insurance Company, New York

Read at the Forty-eighth Annual Meeting
of the Association of Life Insurance
Medical Directors of America,
October 28-29, 1937

308
Z
Vex 509

Copyright 1938
by
The Association of Life Insurance
Medical Directors of America

Printed in U. S. A.

PRESS OF
RECORDING & STATISTICAL CORPORATION
NEW YORK CITY
1938

Gift of
Met. Life Ins. Co.
9-15-39

Jan. 19, 1940 E.B.

THE BUILD OF WOMEN AND ITS RELATION TO THEIR MORTALITY

A PRELIMINARY REPORT

Louis I. Dublin, Ph. D., *Third Vice-President and Statistician*
and Herbert H. Marks, *Metropolitan Life Insurance Company, New York*

The insurance business has moved a long way from its original attitude of fear and doubt toward women as policyholders. In most companies during the past two decades, the volume of life insurance on females, both in number of policies and amount, has, in fact, increased at a much faster rate than insurance on men. Women now form a large and increasing proportion of our insurance clientele. From almost every point of view, they are today desirable insurance risks, and with reasonable care in their selection, the companies accepting them need have no fear that they will have an unfavorable effect on the company's general mortality experience. It goes almost without saying, however, that women as applicants for life insurance present specific problems of underwriting. The practise of the life insurance business in this regard has been a rule of thumb extension of the procedures applicable to men. This has served well enough, but with the rapidly accumulating experience on women, it is time that this experience were analyzed with a view to a more informed treatment of female applicants.

One very important factor in medical underwriting, one which took the insurance business a long time to learn, is the relation of build to mortality. In evaluating build among females so little authentic data have been available that the tables used are the tables on male lives or a simple modification of them. These tables were based on the Medico-Actuarial Mortality Investigation and the 1918 report on build of the Joint Committee on Mortality of this Association and the Actuarial Society. In the former investigation, the data on women were tabulated and analyzed, and while certain tendencies emerged from this study, in the words of the report, "the statistics on the influence of build on mortality of women enabled the Committee to deduce little of substantial value." The meager results of this 1912 study served to discourage the Joint Committee eight years ago when the Medical Impairment Study was being made. Consequently, the build study, made at that time, was limited to male lives. It was in order to fill this important gap in our knowledge that the present study was undertaken. As part of this study it was thought worthwhile to make height and weight tables to see whether the old standards, based on the Medico-Actuarial tables, hold today. There has been much discussion of changes in the stature of the new generation. We have gone through an era in which a craze for reducing has raged among women. We wanted to see if this and other factors had any discernible and lasting effect on the average weights.

Our data are extensive even though they are derived from the experience of a single company. This preliminary report is concerned with our Standard cases, those in our Regular Ordinary Branch (including monthly premium cases). We have used all available records, namely, those for which we had routinely prepared record cards from 1922 to 1934 inclusive. During the first two years 1922 to 1923, a record was made of every policy placed. In 1924 only selected types of risks in the Regular Ordinary Branch were recorded. The classes selected for study contained very few women. From 1925 to 1931 inclusive, record cards were made routinely for one-fifth of all our Standard cases, being an unselected and representative sample. Beginning with 1932, we have recorded approximately 100,000 policies (male and female combined) each year including all issues of $5,000 or more, and excluding monthly premium cases. By this system, approximately one-eighth of all the issues on female lives were recorded. In making up our descriptive tables, allowance has been made for the varying samples used in each year of issue. We checked back to the original application every case in which the height or weight was unusually high or low.

Our descriptive tables are based upon 329,627 policies and our mortality tables on 308,228 policies, the latter figure excluding those cancelled in the year of issue and extremely short and extremely tall women.

Before presenting our findings, a few observations regarding the material are in order. We are dealing very largely with persons whose height and weight were not actually measured at the time of the examination. The facts on height and weight are usually those stated by the applicant. This is especially true of height. The actual weights were more frequently taken in the later years of the experience than in the earlier years. As a consequence, we have the same problem here that has come up in all previous insurance studies of build, namely, a concentration of records in the average height group, generally on all the even inches, and also a high percentage of weights reported in figures ending in zero or five, and secondarily in even numbers. The defect in the record of heights was made somewhat worse by our rule from 1925 on that heights ending in a half inch be recorded to the nearest even inch, i.e., 5′3½″ and 5′4½″ were taken as 5′4″. There may also be a systematic overstatement of weight by those markedly underweight and understatement by those markedly overweight. The measurements of the applicant are presumed to be taken in ordinary street dress, without heavy outer clothing.

Certain other aspects of the material must be kept in mind in judging our results: (1) The type of risk represented by these women insured in the Metropolitan and (2) the internal changes in this group in the years covered by this study. These women are largely drawn from the salaried and wage-earning classes in the urban areas of this country and Canada. They are the wives and daughters in families which are regularly contacted by our agency force. They are, for the most part, housewives, factory workers, stenographers and clerks. While they are drawn from every part of the two countries, there is probably an undue proportion from the eastern seaboard. Again, due to the more intelligent underwriting of female risks in recent years, as well as the increasing proportion which immigrants and their families form in the insurable population, the percentage of women from these groups among our policyholders has increased in recent years. In like manner, the build ratings for women will have some effect on the results, as for example, the restrictions on underweight at the younger ages and on overweight at the older ages. Similar in its effect is the more careful medical selection of those whose weights border on the Standard limits. Unfortunately, we have no numerical measures of some of these factors, but we should not lose sight of them and the effect they may have exercised on our results.

HEIGHT

The mean heights by age in the Standard material are shown in Table 1. The averages rise from approximately 5′3¼″ at age 15, to 5′4¼″ in middle adult life. The maximum height is recorded in the age group 45 to 49. The averages show a slight but persistent fall past 50 years of age. At the younger ages, the increases are fairly large and significant because they represent increments due to normal growth. The differences at the various ages between 25 and 50 are small and are probably of little significance. The averages are approximately the same as those found in the Medico-Actuarial Mortality Investigation, but slightly less than in the Medical Impairment Study.

TABLE 1

Mean Heights of Women by Age

Metropolitan Life Insurance Company,
Standard Issues, 1922-1934

Age	Height in inches	Number of cases
15	63.22	7,195
16	63.63	9,255
17	63.85	11,767
18–19	64.02	33,802
20–24	64.07	90,209
25–29	64.09	60,374
30–34	64.17	42,646
35–39	64.24	31,734
40–44	64.22	20,648
45–49	64.26	12,186
50–54	64.12	6,240
55 and over	64.08	3,571

So far as this Standard material is concerned, the average height of adult American women has not changed. We do not find maximal figures at the younger ages which would be indicative of a steady and progressive rise in the average height from one generation to the next. Moreover, a comparison of the average heights by age of the 1922-1923 and the 1932-1934 Standard issues shows no significant increase in the averages except at age 15. Indeed, at ages past 25, averages for the earlier issues tended to be somewhat higher than for the later ones. These results seem to be little modified by our Substandard material. In this respect, our present data are in conformity with the findings of the Medical Impairment Study. Possibly these fundamental data are so defective that we must discard them as a source of information on this question of changing average heights. We think however, they are not as bad as that. We think rather that in the aggregate they are dependable and lead to the conclusion stated above. This may well be due to the fact that our data included increasing proportions of women of foreign race stocks, many of whom were of smaller stature than our native stocks. Moreover, since the averages remain fairly constant, the figures may also indicate that the newer generation of foreign race stocks is tending to conform in stature to the standards of the native stock.

The lowest height recorded among the women in this study was 4′0″; the greatest height, 6′6″.

WEIGHT CHARACTERISTICS

In Table 2 are given the ungraduated mean and median weights and the standard deviations of these weights around the mean. Throughout most of the table, the data form fairly smooth series. There is a definite and consistent increase in the average weight by age at each inch of height up to a maximum in the early fifties, but beyond this point the averages do not consistently increase.

Although the increases in weight *with age* at each inch of height are consistent, there are notable variations in the size of the increments. Between ages 15 and 16, the increments tend to be larger at the short and at the tall heights than at the middle heights, namely, three to five pounds at the extremes, compared

TABLE 2

Mean and Median Weights of Women and Standard Deviations of the Weights Around the Means. By Age Groups and Inch of Height. Standard Issues Only. Metropolitan Life Insurance Company, Ordinary Department, 1922-1934.

Height	WEIGHT IN POUNDS AT SPECIFIED AGES											
	15	16	17	18-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55 & Over
4′ 8″												
Mean	91.2	*	*	101.6	106.7	107.0	114.0	114.6	*	*	*	*
Median	92.3	*	*	101.2	104.7	105.6	110.0	111.5	*	*	*	*
St. Deviation	11.0	*	*	6.9	12.1	12.3	19.0	15.8	*	*	*	*
4′ 9″												
Mean	94.8	99.3	103.0	104.4	109.9	113.2	113.8	125.8	127.5	*	*	*
Median	93.0	97.1	100.5	102.7	110.0	111.6	114.5	126.8	133.5	*	*	*
St. Deviation	11.2	9.8	9.0	10.2	13.1	14.8	15.1	18.0	17.6	*	*	*
4′ 10″												
Mean	93.3	103.2	101.8	103.2	107.2	112.4	118.5	120.9	126.9	126.7	130.4	127.2
Median	92.2	102.2	99.4	101.3	105.1	110.6	117.9	121.0	129.5	130.1	130.7	127.1
St. Deviation	11.5	13.8	9.7	10.4	13.1	14.8	15.5	17.5	16.1	16.3	14.3	17.3
4′ 11″												
Mean	97.3	101.2	106.3	106.2	107.7	114.6	118.8	125.9	125.6	131.5	126.7	123.7
Median	96.3	102.6	103.8	104.6	104.8	112.1	117.9	125.8	125.6	132.7	126.1	119.4
St. Deviation	9.9	8.7	10.7	10.5	13.6	15.1	15.9	16.4	16.9	15.6	15.8	20.5
5′ 0″												
Mean	102.6	106.3	107.7	110.2	111.6	116.6	121.7	126.4	131.0	132.7	134.5	135.8
Median	101.4	105.0	106.7	108.4	109.1	113.7	120.1	125.8	132.1	134.3	136.0	138.3
St. Deviation	11.5	11.4	10.9	11.9	13.4	15.6	16.3	17.1	16.6	16.4	16.4	17.0
5′ 1″												
Mean	104.9	108.9	109.8	111.8	113.7	119.4	124.6	128.6	131.1	133.1	137.4	135.3
Median	103.5	107.6	109.1	110.3	111.4	117.3	122.7	127.7	131.0	134.2	139.9	135.8
St. Deviation	11.7	11.7	11.1	11.8	13.0	16.0	16.5	17.5	16.9	18.3	17.0	18.1
5′ 2″												
Mean	108.7	111.3	113.5	115.1	116.9	121.5	126.7	131.4	134.5	136.7	138.2	139.0
Median	107.7	110.2	112.5	113.2	114.9	119.2	125.3	131.0	135.1	138.2	139.0	140.3
St. Deviation	11.1	11.4	11.6	12.3	13.3	15.7	16.4	17.0	17.0	17.0	16.8	17.6
5′ 3″												
Mean	112.8	115.6	116.7	118.5	120.4	125.4	130.2	134.6	137.7	140.4	141.5	142.3
Median	111.5	114.3	115.6	116.9	118.5	123.0	128.6	134.0	137.6	141.3	143.6	144.0
St. Deviation	12.3	12.0	11.7	12.5	13.7	16.1	17.0	17.7	17.3	17.6	18.1	18.6
5′ 4″												
Mean	116.3	118.5	120.2	121.8	123.5	128.6	133.4	137.7	141.0	142.5	144.3	144.7
Median	114.6	117.2	118.9	120.3	121.4	126.3	131.4	136.8	140.9	142.8	145.6	145.2
St. Deviation	13.1	13.1	12.8	13.0	14.1	16.3	17.2	17.5	17.5	17.1	17.8	17.1
5′ 5″												
Mean	120.8	121.7	123.6	125.1	127.0	132.3	137.1	141.8	145.3	146.7	150.0	150.9
Median	119.0	120.3	122.2	123.4	124.8	129.9	135.3	141.1	145.0	146.3	150.5	151.7
St. Deviation	14.4	13.2	12.8	13.6	14.8	16.8	17.7	18.0	17.9	17.5	17.8	17.7
5′ 6″												
Mean	123.3	123.9	126.9	128.1	130.6	135.5	141.4	145.7	149.4	151.1	152.6	152.9
Median	121.5	122.4	125.5	126.5	128.4	132.5	139.7	145.0	149.5	151.8	153.9	153.9
St. Deviation	13.9	12.9	14.0	13.4	15.4	17.3	17.9	18.4	18.1	18.6	19.0	17.6
5′ 7″												
Mean	125.4	130.3	131.5	132.2	134.6	140.7	145.2	149.4	152.7	155.3	156.6	158.4
Median	123.1	128.7	129.5	130.4	131.9	138.1	143.4	148.0	152.2	155.8	156.8	157.6
St. Deviation	13.6	14.0	14.9	14.5	16.1	18.1	18.3	19.4	18.6	18.0	18.1	18.0
5′ 8″												
Mean	131.1	134.4	133.8	136.2	139.3	143.2	149.8	154.2	158.0	161.4	164.0	161.5
Median	129.7	132.9	132.1	134.3	136.9	140.3	148.1	154.0	159.4	162.6	167.7	166.3
St. Deviation	14.4	15.6	15.4	15.2	17.3	18.4	19.1	19.7	19.7	18.7	19.4	18.9
5′ 9″												
Mean	131.1	135.7	139.5	139.7	142.1	147.1	156.0	160.5	161.6	166.8	164.3	166.0
Median	129.1	134.0	136.3	136.9	139.0	145.0	154.3	159.8	160.5	169.7	165.1	164.4
St. Deviation	12.6	14.4	16.0	15.1	17.1	18.7	20.1	20.3	19.9	20.1	19.3	17.4
5′ 10″												
Mean	*	143.7	141.8	143.2	147.1	150.1	161.3	164.1	163.4	169.2	171.8	170.8
Median	*	140.3	141.0	139.3	143.0	148.6	160.5	165.4	163.2	172.3	176.9	169.9
St. Deviation	*	17.0	13.6	17.1	18.0	18.8	19.6	20.1	21.0	19.5	19.6	13.5
5′ 11″												
Mean	*	*	*	147.9	150.8	159.0	160.4	165.5	176.8	175.9	*	*
Median	*	*	*	144.7	149.4	159.2	161.0	169.2	177.1	171.6	*	*
St. Deviation	*	*	*	15.9	19.1	20.7	20.6	21.9	18.6	18.4	*	*
6′ 0″												
Mean	*	*	*	*	157.8	163.2	173.1	167.4	*	*	*	*
Median	*	*	*	*	154.5	160.3	178.1	160.8	*	*	*	*
St. Deviation	*	*	*	*	19.4	20.0	21.5	22.6	*	*	*	*

*Less than 20 cases.

to one to three pounds at the middle heights. Between ages 16 and 17, the increments of weight with age are usually one to two pounds and vary less than between ages 15 and 16. Between 17 and age group 18-19, the increments of weight with age are fairly constant at each height, one to two pounds in all but a few cases. This is likewise true between ages 18-19 and 20-24, these increments being two to three pounds in all but a few instances. Between ages 20-24 and 25-29, the increase in the average weight at each inch of height is usually five to six pounds. Approximately the same gain in weight is recorded in the next five years of life at each inch of height. The increments then begin to diminish in size, approximately one pound for each five years of age. Between ages 30-34 and 35-39, the increment is usually four to five pounds; in the next five year interval, three to four pounds; and in the next two periods, two to three pounds. Between ages 50-54 and 55-59, the change in the middle heights, where the data are most abundant, varies from —1 to +1 pound.

There is likewise a consistent increase in the average weight *with increasing height* at each age. These increments are, for the most part, more regular than those with advancing age. Up to 5′3″ or 5′4″, there is usually a three pound increase with each inch of height, and from 5′4″ on an increase of approximately four pounds.

The median weights are generally a pound or two less than the mean weights up to age 35. Between 35 and 45, the two types of averages are approximately the same, but after age 45 the median weights are often higher than the mean weights. The diminishing difference between median and mean, past age 35, is purely artificial and is due merely to the fact that at these ages the extreme overweights are all rated risks. By the very nature of the weight curve the median must be lower than the mean, and when the data for the combined Standard and Substandard are available, this, we believe, will be found to be the case.

COMPARISON WITH THE STANDARD (MEDICO-ACTUARIAL) TABLE

At ages under 20, our averages generally conform, within a pound or two, to the new averages that were compiled in connection with the Medical Impairment Study. At age 15, our averages at the very short heights are somewhat heavier, probably indicating that the Medical Impairment Study table at these points was too steeply graduated. In like manner, our averages at the taller heights tend to be somewhat lower than the Medical Impairment Study table, and again it may be due to the artificial nature of the graduation of those results. At age 16 our averages are likewise somewhat higher at the very short heights, but in fair agreement at all the other heights. At age 17, our table is usually one pound heavier than the Medical Impairment Study, but at 18-19, one pound lighter.

At ages 20-24, our averages are consistently lower than those of the Medico-Actuarial table. At ages 25-29, our averages are within a pound or two of the Medico-Actuarial table, up to and including heights 5′10″. Beginning with age group 30-34, our averages are systematically higher than the Medico-Actuarial table. At the middle heights, the differences are 1-2 pounds at ages 30-34, 2-3 pounds at ages 35-39 and 40-44, and 1-2 pounds at 45-49 and 50-54. Even larger differences are recorded at the taller heights. At 55 and over, our averages are generally a pound or two below the Medico-Actuarial figures. The comparative figures of the two tables are given in Table 3.

These comparisons are based on Standard data only. In the Substandard are included, at the younger ages, large numbers of rateable underweights and a few overweights. But at the middle and later adult ages, there are comparatively few rateable underweights, but many rateable overweights. Consequently, it is likely that we shall, when all the figures are in, show consistently lower average weights at ages 20 to 24 and appreciably higher weights consistently after age 25. The standard height-weight table is based only on those insured at regular rates of premium and, consequently, tends definitely to overstate the averages at the younger ages and understate them at the older ages.

From this comparison, it is clear that the increases in weight by age during adult life are much less regular than in the standard height-weight table. The actual gains between 20 and 40 are larger than the increments of the standard table, and are smaller past 40.

TABLE 3

Average Weights of Women by Height and Age

Metropolitan Life Insurance Company, Standard Issues, 1922-1934 (Ungraduated)* Compared with Medical Impairment Study (Graduated) at Ages Under 20 and Medico-Actuarial Study (Graduated) at Ages 20 and Over.

Height	15		16		17		18–19		20–24		25–29	
	M.L.I. Co.	M.I.S.	M.L.I. Co.	M.I.S.	M.L.I. Co.	M.I.S.	M.L.I. Co.	M.I.S.	M.L.I. Co.	M.A.	M.L.I. Co.	M.A.
4′ 8″	91	87	....	91	....	96	102	102	107	107	107	110
9″	95	91	99	95	103	99	104	104	110	109	113	112
10″	93	95	103	99	102	102	103	106	107	111	112	114
11″	97	99	101	102	106	105	106	108	108	113	115	116
5′ 0″	103	103	106	105	108	107	110	110	112	115	117	118
1″	105	106	109	108	110	110	112	113	114	117	119	120
2″	109	109	111	111	114	113	115	116	117	120	122	122
3″	113	113	116	114	117	116	119	119	120	123	125	125
4″	116	117	119	118	120	119	122	122	124	126	129	129
5″	121	121	122	122	124	123	125	125	127	129	132	132
6″	123	125	124	126	127	127	128	129	131	133	136	136
7″	125	129	130	130	132	131	132	133	135	137	141	140
8″	131	133	134	134	134	135	136	137	139	141	143	144
9″	131	137	136	138	140	139	140	141	142	145	147	148
10″	—	141	144	142	142	143	143	145	147	149	150	152
11″	....	145	....	146	....	147	148	149	151	153	159	155
6′ 0″	....	149	....	150	....	151	....	153	158	157	163	159

Height	30–34		35–39		40–44		45–49		50–54		55 and over	
	M.L.I. Co.	M.A.	M.L.I. Co.	M.A.	M.L.I. Co.	M.A.	M.L.I. Co.	M.A.	M.L.I. Co.	M.A.	M.L.I. Co.	M.A.
4′ 8″	114	113	115	116	....	120	—	123	....	125	....	126
9″	114	115	126	118	128	122	....	125	—	127	....	128
10″	119	117	121	120	127	124	127	127	130	129	127	130
11″	119	119	126	122	126	126	132	129	127	131	124	132
5′ 0″	122	121	126	124	131	128	133	131	135	133	136	134
1″	125	123	129	126	131	130	133	133	137	135	135	137
2″	127	125	131	129	135	133	137	136	138	138	139	140
3″	130	128	135	132	138	136	140	139	142	141	142	143
4″	133	132	138	136	141	139	143	142	144	144	145	146
5″	137	136	142	140	145	143	147	146	150	148	151	150
6″	141	140	146	144	149	147	151	151	153	152	153	153
7″	145	144	149	148	153	151	155	155	157	157	158	158
8″	150	148	154	152	158	155	161	159	164	162	162	163
9″	156	152	161	156	162	159	167	163	164	166	166	167
10″	161	155	164	159	163	162	169	166	172	170	171	173
11″	160	158	166	162	177	166	176	170	....	174	....	177
6′ 0″	173	162	167	165	....	169	....	173	....	177	....	182

*Averages not computed where number of cases was less than 20.

There is no gain past 50-54 and the increase shown by the standard table is, in our judgment, questionable. Indeed, inspection of the original Medico-Actuarial data confirms this observation.

COMPARATIVE MORTALITY BY BUILD GROUPS

For the mortality study, we have divided our material into three broad height groups and nine broad weight groups. The height groups are:

Short	4′8″ to 5′1″
Medium	5′2″ to 5′6″
Tall	5′7″ to 6′0″

We have excluded from this part of the study very short and tall women, i.e., those under 4′8″ and over 6′0″.

The weight groups, which represent percentage departures from the average weight, for height and age, of the Medico-Actuarial table, are given below. Here there was a choice either of pound or percentage groups. We judged the latter to be the more suitable.

Underweight
  25% or more
  15–24%
  5–14%
Average Weight
Overweight
  5–14%
  15–24%
  25–34%
  35–44%
  45% or more

Since we are dealing with Standard issues only, the ratings for build have a considerable effect on the relative volume of the experience at the several age groups at issue. Thus, at the younger ages, the ratings for underweight are more severe than at the older ages, but the reverse is true for overweights. Consequently, the extreme underweight group in the Standard experience was made up largely of older women, while the extreme overweight group was made up almost solely of younger women. For this and other reasons, the mortality ratios at all ages at issue com-

TABLE 4

Mortality of Women According to Build

Ratios of Actual to Expected Deaths by Metropolitan Female Mortality Table, 1922-1936 (Ungraduated). By Age Groups at Issue and by Duration of Insurance. Standard Issues Only.

Metropolitan Life Insurance Company, Ordinary Department, Issues of 1922-1934 Carried to Anniversary in 1936.

Build Group	Exposed	AGGREGATE									
		Per Cent. Actual of Expected Deaths					Deaths				
		All Ages	Under 30	30-39	40-49	50 & Over	All Ages	Under 30	30-39	40-49	50 & Over
GRAND TOTAL	2,015,222	100.0	100.0	100.0	100.0	100.0	6,621	2,929	1,661	1,231	800
Underweight											
25% or more	10,072	90.3	96.6	106.6	90.2	74.5	48	6	14	16	12
15–24%	183,114	96.1	105.0	92.6	86.3	92.3	611	261	154	115	81
5–14%	566,730	98.5	102.0	105.5	81.1	89.2	1,685	930	410	209	136
Average weight	559,857	100.3	99.0	95.4	114.4	94.6	1,776	851	383	344	198
Overweight											
5–14%	392,453	101.1	96.9	97.1	102.6	115.7	1,402	503	345	306	248
15–24%	207,744	100.0	97.0	98.1	107.0	98.1	771	237	220	207	107
25–34%	75,678	117.3	108.0	123.7	116.9	149.0	280	109	123	33	15
35–44%	17,347	93.7	83.2	105.5	*	*	44	28	12	1	3
45% and Over	2,227	*	*	*	*	*	4	4	--	--	--
SHORT HEIGHT											
Underweight											
25% or more	1,493	124.1	*	*	*	*	9	2	1	2	4
15–24%	23,083	120.0	125.9	141.3	104.9	89.8	95	41	27	16	11
5–14%	65,804	109.5	106.2	100.5	122.9	130.6	215	114	44	31	26
Average weight	62,648	99.7	97.6	82.1	134.8	94.3	190	100	30	38	22
Overweight											
5–14%	44,208	102.0	90.5	98.7	130.1	92.9	161	52	39	47	23
15–24%	25,589	123.9	120.6	130.9	102.0	148.3	120	35	39	23	23
25–34%	9,395	129.2	129.2	133.3	118.2	*	39	16	17	5	1
35–44%	2,593	69.1	*	*	*	*	5	4	1	--	--
45% and Over	392	*	*	*	*	*	1	1	--	--	--
MEDIUM HEIGHT											
Underweight											
25% or more	6,850	88.2	*	124.2	99.3	59.7	33	2	11	13	7
15–24%	133,156	92.4	106.1	82.0	80.7	91.1	428	192	98	80	58
5–14%	422,546	97.1	99.1	110.0	77.1	85.9	1,230	679	310	147	94
Average weight	422,328	100.3	96.7	99.9	113.1	97.3	1,336	626	306	253	151
Overweight											
5–14%	291,704	100.3	96.8	98.4	96.5	117.8	1,020	381	254	204	181
15–24%	152,789	97.6	95.4	94.9	107.7	90.0	550	176	149	152	73
25–34%	55,322	115.7	104.5	122.7	123.5	132.9	202	76	90	25	11
35–44%	12,744	99.0	88.2	110.8	*	*	34	22	9	1	2
45% and Over	1,565	*	*	*	*	*	3	3	--	--	--
TALL HEIGHT											
Underweight											
25% or more	1,729	70.3	*	*	*	*	6	2	2	1	1
15–24%	26,875	94.0	79.7	104.7	100.6	101.2	88	28	29	19	12
5–14%	78,380	96.8	114.4	88.8	73.8	69.3	240	137	56	31	16
Average weight	74,881	100.7	113.9	80.1	108.6	80.8	250	125	47	53	25
Overweight											
5–14%	56,541	104.0	102.5	90.1	108.6	122.4	221	70	52	55	44
15–24%	29,366	91.4	84.5	85.2	107.5	88.5	101	26	32	32	11
25–34%	10,961	115.1	107.5	120.0	*	*	39	17	16	3	3
35–44%	2,010	93.6	*	*	*	*	5	2	2	--	1
45% and Over	270	*	*	*	*	*	--	--	--	--	--

*Less than 5 deaths.

TABLE 4—Continued

Mortality of Women According to Build

Ratios of Actual to Expected Deaths by Metropolitan Female Mortality Table, 1922-1936 (Ungraduated). By Age Groups at Issue and by Duration of Insurance. Standard Issues Only.

Metropolitan Life Insurance Company, Ordinary Department, Issues of 1922-1934 Carried to Anniversary in 1936.

Build Group	FIRST FIVE POLICY YEARS									
	Per Cent. Actual of Expected Deaths					Deaths				
	All Ages	Under 30	30-39	40-49	50 & Over	All Ages	Under 30	30-39	40-49	50 & Over
GRAND TOTAL	100.0	100.0	100.0	100.0	100.0	3,307	1,573	813	551	370
Underweight										
25% or more	97.0	*	132.5	76.9	69.6	23	4	8	6	5
15-24%	100.3	109.2	89.7	92.9	102.4	317	147	73	55	42
5-14%	100.5	100.2	110.3	88.7	94.8	891	505	214	103	69
Average weight	97.9	99.4	91.3	98.5	103.3	883	465	182	136	100
Overweight										
5-14%	101.9	97.5	96.2	110.5	112.1	697	267	168	149	113
15-24%	97.3	93.9	103.7	106.4	75.5	355	116	113	90	36
25-34%	113.6	112.8	114.9	122.1	*	122	56	51	12	3
35-44%	92.3	81.7	*	*	*	18	12	4	--	2
45% and Over	*	*	*	*	*	1	1	--	--	--
SHORT HEIGHT										
Underweight										
25% or more	*	*	*	*	*	3	1	1	--	1
15-24%	134.6	153.8	133.7	141.6	*	54	27	13	10	4
5-14%	109.2	106.5	97.0	111.6	153.0	111	63	21	13	14
Average weight	95.6	98.0	65.3	106.1	122.4	94	55	12	14	13
Overweight										
5-14%	112.2	107.1	97.9	144.7	102.6	87	32	19	24	12
15-24%	118.1	98.2	159.2	73.9	139.1	52	14	22	7	9
25-34%	121.3	152.5	91.6	*	*	16	9	5	2	--
35-44%	*	*	*	*	*	2	2	--	--	--
45% and Over	*	*	*	*	*	--	--	--	--	--
MEDIUM HEIGHT										
Underweight										
25% or more	101.9	*	141.2	104.7	*	17	2	6	6	3
15-24%	96.2	108.9	85.1	82.2	97.0	222	107	50	36	29
5-14%	97.4	95.5	114.8	81.3	90.9	645	364	163	70	48
Average weight	98.2	96.7	96.4	98.4	109.3	669	342	147	101	79
Overweight										
5-14%	98.3	96.5	98.5	96.7	105.4	496	201	126	92	77
15-24%	96.7	97.2	98.8	110.7	66.7	260	91	76	69	24
25-34%	112.4	104.9	124.0	100.1	*	89	38	41	7	3
35-44%	91.1	82.9	*	*	*	13	9	2	--	2
45% and Over	*	*	*	*	*	1	1	--	--	--
TALL HEIGHT										
Underweight										
25% or more	*	*	*	*	*	3	1	1	--	1
15-24%	90.3	69.2	77.4	107.5	168.2	41	13	10	9	9
5-14%	109.5	122.3	98.9	109.0	64.6	135	78	30	20	7
Average weight	97.9	117.1	81.0	94.6	57.4	120	68	23	21	8
Overweight										
5-14%	111.5	95.3	84.1	142.4	150.0	114	34	23	33	24
15-24%	82.9	70.6	82.2	109.3	*	43	11	15	14	3
25-34%	112.7	119.7	85.3	*	*	17	9	5	3	--
35-44%	*	*	*	*	*	3	1	2	--	--
45% and Over	*	*	*	*	*	--	--	--	--	--

*Less than 5 deaths.

TABLE 4—Continued

Mortality of Women According to Build

Ratios of Actual to Expected Deaths by Metropolitan Female Mortality Table, 1922-1936 (Ungraduated). By Age Groups at Issue and by Duration of Insurance. Standard Issues Only.

Metropolitan Life Insurance Company, Ordinary Department, Issues of 1922-1934 Carried to Anniversary in 1936.

Build Group	SIXTH AND LATER POLICY YEARS									
	Per Cent. Actual of Expected Deaths					Deaths				
	All Ages	Under 30	30-39	40-49	50 & Over	All Ages	Under 30	30-39	40-49	50 & Over
GRAND TOTAL	100.0	100.0	100.0	100.0	100.0	3,314	1,356	848	680	430
Underweight										
25% or more	84.8	*	84.6	100.6	78.5	25	2	6	10	7
15-24%	91.9	100.0	95.3	81.0	83.4	294	114	81	60	39
5-14%	96.3	104.2	100.6	74.8	84.1	794	425	196	106	67
Average weight	102.8	98.6	99.4	127.9	87.0	893	386	201	208	98
Overweight										
5-14%	100.3	96.1	97.9	96.1	118.8	705	236	177	157	135
15-24%	102.4	100.2	92.8	107.5	115.7	416	121	107	117	71
25-34%	120.4	103.3	130.8	114.1	185.2	158	53	72	21	12
35-44%	94.8	84.4	110.5	*	*	26	16	8	1	1
45% and Over	*	*	*	*	*	3	3	--	--	--
SHORT HEIGHT										
Underweight										
25% or more	159.2	*	*	*	*	6	1	--	2	3
15-24%	104.9	93.2	149.1	73.3	108.2	41	14	14	6	7
5-14%	109.8	105.8	103.9	132.5	111.5	104	51	23	18	12
Average weight	104.2	97.2	99.3	160.1	70.8	96	45	18	24	9
Overweight										
5-14%	92.2	72.4	99.6	117.7	84.2	74	20	20	23	11
15-24%	128.7	142.2	106.4	122.4	154.9	68	21	17	16	14
25-34%	135.4	108.0	164.6	*	*	23	7	12	3	1
35-44%	*	*	*	*	*	3	2	1	--	--
45% and Over	*	*	*	*	*	1	1	--	--	--
MEDIUM HEIGHT										
Underweight										
25% or more	77.3	*	108.5	95.1	*	16	--	5	7	4
15-24%	88.5	102.9	78.9	79.4	85.8	206	85	48	44	29
5-14%	96.7	103.7	105.0	73.7	81.2	585	315	147	77	46
Average weight	102.4	96.7	103.4	125.6	86.9	667	284	159	152	72
Overweight										
5-14%	102.2	97.1	98.2	96.3	129.0	524	180	128	112	104
15-24%	98.4	93.6	91.2	105.4	108.6	290	85	73	83	49
25-34%	118.4	104.1	121.6	135.8	148.4	113	38	49	18	8
35-44%	104.5	92.3	135.1	*	*	21	13	7	1	--
45% and Over	*	*	*	*	*	2	2	--	--	--
TALL HEIGHT										
Underweight										
25% or more	*	*	*	*	*	3	1	1	1	--
15-24%	97.6	91.6	128.6	95.1	*	47	15	19	10	3
5-14%	84.3	105.5	79.4	46.5	73.5	105	59	26	11	9
Average weight	103.5	110.3	79.2	120.3	99.9	130	57	24	32	17
Overweight										
5-14%	96.9	110.4	95.6	80.1	100.3	107	36	29	22	20
15-24%	98.8	98.7	87.9	106.1	111.3	58	15	17	18	8
25-34%	117.1	96.4	147.3	*	*	22	8	11	--	3
35-44%	*	*	*	*	*	2	1	--	--	1
45% and Over	*	*	*	*	*	--	--	--	--	--

*Less than 5 deaths.

bined are of little import. Another important influence is medical selection, which is probably more severe where the weights are close to the limits, either underweight or overweight, permissible for Standard insurance. The irregularities in the mortality curves for the extreme weight groups are partly attributable to this factor.

Table 4 presents the ratios of actual to expected deaths at all ages and in four broad *age groups at issue* for the build groups described. The mortality ratios are computed on an ungraduated mortality table based upon the summed experience of these cases, by age at issue and by duration of insurance. The mortality ratios are also ungraduated, representing the actual mortalities recorded. Mortality ratios appear in the table for every group in which there were at least five actual deaths. This number is not, of course, large enough to give a reliable mortality ratio. It is necessary throughout in evaluating the ratios to keep in mind the number of deaths, which are also given in the table. Many of the irregularities in the mortality curves are due to the small size of the samples. Such irregularities are common in all mortality investigations. They occurred, for example, in the Joint Committee's investigation of the influence of build on the mortality of males, both in 1912 and in 1929. As Mr. Larus pointed out in his talk on Statistical Principles at last year's meeting, the amount of material necessary for an investigation which will show significant trends is surprisingly large. Ordinarily about 100 deaths are required if the material for investigation is fairly normal, although a smaller number is sufficient if the class is distinctly abnormal. It is too much to expect, in this or any mortality investigation, that the smaller sub-divisions will give an unmistakably regular trend. It is enough if a general pattern can be identified. The results of this investigation, in our judgment, satisfy this condition.

ALL HEIGHTS COMBINED

At *ages under 30,* the most favorable mortality (in the groups with sizable numbers of exposed to risk and deaths) was found among those slightly (5–14%) and moderately (15–24%) overweight, but the ratios for these groups were not significantly different from that for the average weights. From these low levels, the mortality increased to its highest point in the 25–34% overweight group. The next highest was for those 15–24% underweight. The limited experiences on the extreme overweights and underweights have been good. Despite a rather good progression of the mortality ratios from a high point at 15–24% underweight down to a low level among the moderate overweights and then up to another peak among the more obese young risks, the remarkable feature of the mortality at the younger ages has been the relatively small variation in the ratios according to weight, amounting to less than 12 per cent. if we except the highest overweight group which is based upon a relatively small experience. The mortality curves by weight in both the first five and sixth and later insurance years were essentially similar to those for the aggregate experience.

At *ages 30-39,* the situation was in many respects similar to that in the preceding age period. The lowest mortality ratio was found at 15–24% underweight, but since the ratios on either side of this group were considerably higher, it is apparent that underweight is still a slight disadvantage at these ages. The ratios in the average weight group and the first two overweight groups were slightly more favorable. The mortality then increased sharply to a maximum for the age period among those 25–34% overweight. It is interesting to note that apart from this one group, the range of mortality ratios at these ages also has been still fairly small—less than 15%.

Comparison of the results in the first five and the sixth and later years, showed a slight improvement in the relative mortality of the underweights with increasing duration of insurance, but the mortality of those 25–34% overweight rose sharply.

At *ages 40-49,* the best mortality was recorded among those slightly below average weight. The other underweight groups showed only slightly less favorable results. Curiously enough, the average weight group had a high mortality. We believe, however, that this finding is purely accidental. At any rate we have not been able to account for it. Apart from this anomaly, there was a steady upward progression of the mortality ratios with increasing degree of overweight. In this age group, the relative mortality of underweights improved in the later insurance years. Consequently, the margin between the mortality ratios of the underweights and overweights was slightly higher in the later insurance years, as compared with the early years. Incidentally, it is at the longer durations that the mortality of the average weight group has been so bad. In the early insurance years, they showed an average mortality.

At *ages 50 and over,* the most advantageous mortality was among the underweights. The best showing was in the small experience on those 25% or more underweight. The mortality ratios rose steadily with increasing weight, except for a slight irregularity in the curve among the underweights and a more marked one among the overweights. But neither of these irregularities was contrary to the general trend of a favorable mortality among underweights and an excessive one among overweights. In the sixth and later insurance years, the trend was more regular than at all years combined. The advantage of the underweights and the increasing mortality of overweights then stood out more clearly. The picture in the early insurance years is somewhat confused, although, as a whole, the underweights had a better mortality than the overweights.

MORTALITY BY BUILD IN SEPARATE HEIGHT CLASSES

The curves of mortality according to build in the several height classes have had the same general pattern, although there are numerous irregularities. These may arise from the small size of some of the groups, from the influence of medical selection or from other causes. At *ages under 30,* short and medium height women in the 15–24% underweight group had mortalities considerably above the general average, and the ratios decreased fairly regularly with increasing weight to a minimum among the overweights—in the 5–14% group among short women and in the 15–24% group among medium height women. Both curves rose sharply from their low point and the ratios at 25–34% overweight were at or near the peak for the age group. The amplitude of the mortality curve

of short women was much greater than in women of medium height.

The mortality curve according to build among tall women under 30 resembles those of the other two height groups in certain respects, namely, (1) a high mortality among those slightly underweight, as compared with those slightly or moderately overweight and (2) a steep rise in the mortality from the low point in the 15–24% overweight group to the 25–34% overweight group. The experience among tall women 15–24% underweight has been good, but the experience was not large. This departure from the general picture may not be of any great consequence. The size of the experiences on the short and tall women at ages under 30 was not large enough to yield significant information as to the effect of duration of insurance on the results. In the medium height group the build mortality curves of the two periods were roughly parallel.

The experiences at *ages 15-19 and 20-29* were analyzed separately for two weight groups, 15–24% underweight and 15–24% overweight, but the results were not significantly different from the aggregates for the two age groups.

At *ages 30-39,* the curves of mortality by build in the three height groups are strikingly similar. All begin at a high point on the underweight side. Among the short and tall women, the ratios dropped sharply from the initial point at 15–24% underweight to a minimum in the average weight group, and then rose steadily with increasing weight, except for a slight irregularity in the curve for tall women, to another peak at 25–34% overweight. Among the medium height women, the curve started at a high point at 25% or more underweight and dropped sharply to a minimum at 15–24% underweight, but then rose sharply again at 5–14% underweight. It declined gradually with increasing weight to a minimum at 15–24% overweight, and then increased abruptly at 25–34% overweight. Despite the seemingly irregularity of this curve, the general trend was a relatively high mortality among underweights, a low mortality in the average and moderately overweight women and a sharply increasing mortality among those excessively overweight.

At *ages 40-49,* there are points of similarity between the curves of the three height groups, but these are obscured by variations at certain points in each of the curves. The situation is best summarized in the statement that in the aggregate the mortality is lowest among the underweights in each height group. In two of the height groups, this advantage of underweights was distinctly greater at the longer durations of insurance. The average weight women at 40-49 in all three height groups had a high mortality for which we have found no explanation. It may be noted, however, that in the medium height group the mortality ratio for average weight women is exceeded by that of the more obese and among tall women the differences between the ratios of the average and overweight groups are not significant.

At *ages 50 and over,* the data were much less abundant than at the younger ages and, consequently, there were considerable fluctuations in the curves of mortality by weight groups. Despite this, there was a clearly discernible trend in all height groups from a relatively low mortality among underweight women at these ages, to a high mortality among overweights. At the short and medium heights, this trend stood out even more clearly in the sixth and later insurance years than in the early years.

Discussion of the Mortality in Weight Groups

On the whole, the general picture of the mortality according to build stands out rather clearly. In its broader outlines, the picture is the same as among males, but with certain differences in detail which may be significant. The characteristics of the mortality curve vary with age. At the younger ages, the mortality is generally least favorable among underweights and those too much overweight. It is most favorable among those moderately overweight. Among women in their thirties, the extra mortality among the underweights begins to disappear; the point of most favorable mortality shifts toward the average weight group and the penalty of overweight becomes somewhat more pronounced. After 40, those moderately underweight do best, and overweight becomes an increasingly serious impairment. This trend becomes more definite with advancing age. These broad characteristics of the mortality by weight groups are not affected by height.

This general description fits both sexes. There may be, however, some difference in the degree of variation. We have made

a very rough comparison of the variations in the mortality ratios by age and weight groups with the similar data on males of the Medical Impairment Study. The ratios for females show less marked departures from the general average by weight groups. Thus, at ages under 30 the high mortality on the underweight side among males is 15% above average, compared with only 5% among our females. Likewise among men 25–34% overweight the excess is 34% compared to an excess of only 8% among our females. This phenomenon appears in every age group. It is not so clear among the overweights over age 50, but at this point our samples are relatively small.

Influence of Height on Mortality

In the aggregate, the mortality of women of short height has been distinctly above the average. The ratio of actual to expected deaths for this group was 109.0 per cent., compared with 98.8 per cent. recorded for both medium height and tall women. The high mortality of short women was found to exist both in the first five and the sixth and later insurance years. The mortality of medium height women was slightly better than that of tall women in the early insurance years, but this situation was reversed in the later years.

The short height women showed above-average mortalities in every age group and both in the early and late insurance years. The greatest excesses were found at the older ages. At 40-49, the mortality of short women was 121.1 per cent. or one-fifth worse than the general experience at these ages.

At ages under 30, the most favorable mortality has been recorded among medium height women. Between ages 30 and 39, the tall women have done best. Past 40 there is, in the aggregate, no marked difference between the mortality ratios of the medium height and tall women. There are, however, differences between the early and late insurance years in this respect. At the longer durations, the mortalities are decidedly most favorable among taller women. The facts on the influence of height on mortality are shown in Table 5.

TABLE 5

Influence of Height on Mortality of Women

Per Cent. Actual of Expected Deaths by
Metropolitan Female Mortality Table, 1922-1936 (Ungraduated)
By Height Groups and by Age Groups at Issue. Standard Issues Only.
Metropolitan Life Insurance Company, Ordinary Department,
Issues of 1922-1934 Carried to the Anniversary in 1936.

Age Height Group	Actual of Expected Deaths Per Cent.			Deaths		
	All years	First 5 years	6th and later years	All years	First 5 years	6th and later years
All Ages						
Short	109.0	109.8	108.2	835	419	416
Medium	98.8	98.1	99.6	4,836	2,412	2,424
Tall	98.8	102.0	95.8	950	476	474
Under 30						
Short	104.8	109.2	99.8	365	203	162
Medium	98.2	97.5	99.1	2,157	1,155	1,002
Tall	105.6	106.4	104.8	407	215	192
30–39						
Short	106.8	103.3	110.1	198	93	105
Medium	101.1	102.1	100.1	1,227	611	616
Tall	90.2	87.5	92.6	236	109	127
40–49						
Short	121.1	115.8	125.5	162	70	92
Medium	97.2	94.5	99.3	875	381	494
Tall	98.6	114.3	86.0	194	100	94
50 and over						
Short	111.1	116.9	106.2	110	53	57
Medium	98.9	97.4	100.3	577	265	312
Tall	96.2	99.0	94.0	113	52	61

We are not yet prepared to say what these variations in mortality according to height mean. It may be, of course, that the taller women are intrinsically better from the biological viewpoint. But we shall have to know more about the internal character of our group before we can be certain of such a conclusion. Indeed, we are inclined to believe that the favorable results in the tall group reflect racial and social factors more than biologic ones. For, we know that within the more favorably situated economic groups, the average height is greater than in the less favorably situated groups, other things being equal. We know also that the shorter group includes a larger proportion than the tall group of foreign born women and women of foreign descent, among whom the economic and social status is, on the average, appreciably poorer than in native born women. These factors may be the cause of the differences shown, but a definite answer waits upon further investigation. Possibly a study of this material by amounts of insurance would help us to understand the differences and their causes.

CAUSES OF DEATH

The mortality from certain causes of death varied greatly according to build. Some of the respiratory diseases took their heaviest toll among underweight women, while the cardiovascular and renal diseases, cancer, gall bladder conditions and diabetes were particularly prevalent among overweight women. Puerperal deaths also appeared high among overweights. Although this finding accords with clinical observation, this result is clouded because the rates are based on the total women exposed to risk and not on the number of births. Some causes of death show no distinct trend according to build. The relationship between causes of death and build are shown in Table 6.

This table gives the number of deaths from important causes in such detail as is warranted by the number of deaths, and ratios of actual to expected deaths from these causes have been computed on the basis of the death rates in the experience as a whole. Examination of the table shows that some of the variations in mortality according to build are little affected by age. In other cases, the differences diminish with advancing age, while in still others they are accentuated by age. In certain cases, the tendencies are accentuated with increasing duration of insurance when the effect of medical selection has worn off. Reference is made in the text to the findings according to duration when they are significant, but the figures have been omitted from the table.

The mortality from *tuberculosis* was 60 per cent. higher among those 15 per cent. or more underweight than the average for the group. The ratios declined progressively with increasing

TABLE 6

Mortality of Women from Specified Causes According to Build

Deaths and Ratios of Actual to Expected Deaths Calculated on Basis of Death Rates in Combined Standard Experience. By Build and Age Groups at Issue. Metropolitan Life Insurance Co., Ordinary Department, Issues of 1922-1934 Carried to Anniversary in 1936.

(Note: Ratios which apply to combined weight groups are centered between the limits of those groups.)

Cause of Death Age at Issue	Ratio Actual to Expected Deaths								Deaths							
	Underweight			Av. Wt.	Overweight				Underweight			Av. Wt.	Overweight			
	25% or more	15-24%	5-14%		5-14%	15-24%	25-34%	35-44%	25% or more	15-24%	5-14%		5-14%	15-24%	25-34%	35-44%
Influenza and Pneumonia, total																
All ages	192	131	91	101	101	85	97		8	66	123	141	111	52	23	
Under 30	142		79	87	125	116	116		29		56	58	51	23	13	
30-39	155		120	97	72	79	91		25		42	35	23	16	9	
40 and over	111		86	132	101	59			20		25	48	37	14		
Influenza																
All ages		165	91	92	112	89				26	39	40	38	22		
Under 40		173	105	86	96	91				20	37	29	23	17		
40 and over		67		110	123					8		11	20			
Broncho Pneumonia																
All ages		77		100	117	83				24		24	23	12		
Under 40		73		58	128	134				15		9	14	12		
Lobar and Unspecified Pneumonia																
All ages		119	99	108	89	76	134			31	69	77	50	24	17	
Under 30		89		99	123	112				43		35	27	19		
30-39		127		110	74					32		20	23			
40-49		109		141	64					18		18	14			
50 and over		103			101					11			8			
Tuberculosis, all forms																
All ages	160		134	96	73	33			134		378	260	127	42		
Under 30	140		132	96	76	38			91		322	221	104	36		
30-39	202		147	102	43				28		45	32	23			
40 and over	316		136	67					15		11	13				
Syphilis		109		111	91					12		9	12			

TABLE 6—Continued

Cancer, all forms																
All ages	93	89	90	101	114	94	136		12	97	219	272	279	136	49	
Under 30	87		95	96	115	117	119		15		53	50	38	20	9	
30-39	100		90	99	101	107	134		33		63	72	66	45	24	
40-49	77		86	119	114	80	150		34		65	105	100	45	12	
50 and over	96		93	79	129	89			27		38	45	75	26	4	
Cancer of Stomach																
All ages		127	84	93	115	84				15	21	27	31	16		
Under 40		172	65	94	116	81				7	7	10	10	6		
40 and over		103	99	93	114	86				8	14	17	21	10		
Cancer of Liver and Gall Bladder		106		128	89					16		15	17			
Cancer of Peritoneum, Intestines and Rectum																
All ages		79		104	120	113				50		51	53	37		
Under 40		96		111	107	106				30		25	19	16		
40 and over		62		99	129	119				20		26	34	21		
Cancer of Genital Organs																
All ages		99	89	92	110	105	142			32	63	72	79	45	16	
Under 30		105		104	101					17		12	13			
30-39		118	70	87	106	140	136			13	18	23	25	21	9	
40-49		81	102	88	116	106				9	22	22	29	17	3	
50 and over		91		99	95					16		15	23			
Cancer of Breast																
All ages		93		106	113	99				67		58	56	37		
Under 30		119		81	118					18		9	15			
30-39		75		97	122	125				15		14	16	15		
40-49		90		131	94	84				25		28	20	13		
50 and over		99		91	113					9		7	14			
Cysts and Other Benign Tumors of Ovary		102		108	101					9		7	10			
Benign Tumors of Uterus		78		107	111	104				21		21	19	15		
Acute Rheumatic Fever		90		92	82					9		7	6			
Diabetes																
All ages		105	69	68	122	162				11	18	20	30	27		
Under 40		102		77	67	155				20		12	7	12		
40 and over		54		57	163	168				9		8	23	15		
Pernicious Anemia		128		73	74					14		6	9			
Toxic Goiter		104		112	80					17		14	14			
Cardiovascular-renal Diseases																
All ages		73	89	106	101	120	153	141		89	244	326	278	191	60	8
Under 30		71	104	108	93	66	175	196		15	77	75	40	14	16	6
30-39		47	91	94	104	141	156			14	63	67	67	58	28	
40-49		80	78	114	86	146	131			31	58	99	74	82	11	
50 and over		88	81	106	119	91	131			29	46	85	97	37	5	

TABLE 6—Continued

Cause of Death Age at Issue	Ratio Actual to Expected Deaths								Deaths							
	Underweight				Overweight				Underweight				Overweight			
	25% or more	15-24%	5-14%	Av. Wt.	5-14%	15-24%	25-34%	35-44%	25% or more	15-24%	5-14%	Av. Wt.	5-14%	15-24%	25-34%	35-44%
Cerebral Hemorrhage, Embolism, etc.																
All ages		81	82	117	96	106	174		3	23	48	80	62	40	13	
Under 40			98	114	92	144			1		20	23	15	20		
40-49	91		75	114	107	110			12		17	30	28	21		
50 and over	122		70	125	87	99			13		11	27	19	12		
Angina Pectoris and Coronary Artery Disease		75		103	120	143				19		21	24	20		
Organic Heart Disease																
All ages		77	91	105	100	114	149	186		44	122	153	126	83	30	6
Under 30		98	104	99	89	60	184			13	48	43	24	8	14	
30-39		71	83	96	111	132	124			11	30	36	37	28	13	
40-49		69	81	131	70	138	189			11	25	47	25	32	7	
50 and over		74	90	91	133		102			9	19	27	40		17	
Chronic Nephritis																
All ages		52	98	102	101	136	124			14	60	70	61	47	11	
Under 40		84		100	98	135	141			39		34	25	20	9	
40-49		68		108	64	201				14		17	10	24		
50 and over		100		100	135	49				21		19	26	5		
Acute Endocarditis and Myocarditis																
All ages		122		105		74				36		23		21		
Under 40		124		97		77				33		19		19		
Pleurisy		196			74					13			8			
Ulcer of Stomach and Duodenum		65		99	114					9		10	14			
Ulcer of Stomach		93		127	87					7		7	6			
Appendicitis																
All ages		90		88	121	118				60		44	44	31		
Under 40		93		83	121	130				51		34	33	26		
40 and over		79		110		104				9		10		16		
Intestinal Obstruction		67		115	118					15		19	23			
Cirrhosis of Liver		95		103		111				12		10		17		

TABLE 6—Continued

Biliary Calculi and Other Diseases of Gall Bladder, total																
All ages		37		68	119	199	437			16		22	32	31	21	
Under 40		25		75	136	167	468			7		15	20	14	19	
40 and over		59		58	99	236				9		7	12	19		
Biliary Calculi		40		52	109	201	537			9		9	16	17	13	
Other Diseases of Gall Bladder		40		94	110	214				7		12	12	18		
Acute Nephritis		113		117		89				12		9		9		
Non-Venereal Diseases of Genital Organs, n. e. c.																
All ages		96		108	92	109				35		29	19	18		
Under 40		101		114	77	102				32		26	13	14		
Diseases of the Puerperal State																
All ages, 15-39		93	90	105	105	112	131			45	142	156	103	56	28	
15-29		92	87	104	105	125	159			33	111	121	74	42	22	
30-39		93	101	111	107	82				12	31	35	29	20		
Puerperal Septicemia																
All ages, 15-39		91	87	101	106	111	175			14	45	50	34	18	12	
15-29		89		101	92	149				50		42	23	25		
30-39			90			122					17			16		
Puerperal Albuminuria																
All ages, 15-39		137	83	96	110	124				13	26	28	21	17		
15-29		147	76	93	126	139				10	19	21	17	12		
30-39			109			85					17			9		
Puerperal Causes n. e. c. (except "other")																
All ages, 15-39		77	95	114	100	104	116			18	70	78	46	25	12	
15-29		72	90	111	104	124				12	52	58	33	27		
30-39		106		123		86				24		20		23		
Suicide																
All ages		101		101	111	86				54		41	34	19		
Under 40		95		97	119	102				39		30	25	16		
40 and over		123		115		75				15		11		12		
Accidents																
All ages		96	102	87	109		104			29	92	79	72		51	
Under 30		98	102	95	97		107			15	60	53	32		24	
30-39		109		56	133		108			27		10	21		16	
40 and over		86		92	108		95			19		16	19		11	
Pedestrians in Automobile Accidents																
All ages			63			147					13			18		
Under 40			64			149					9			11		

weight. In those 15 per cent. or more overweight, the mortality was only 33 per cent. of the expected. The differences were most marked in the age group 30 to 39 at issue. The mortality from *pneumonia and influenza* was likewise highest among those markedly underweight. But there was no significant difference between the other weight groups. At ages under 30, excessive mortalities were recorded both among those 15 per cent. or more underweight and among overweights. At ages 30 to 39, the mortality was excessive among underweights only. Past 40 the fluctuations were such as to obscure any relationship between build and mortality from these causes.

For *lobar pneumonia* (including pneumonia unspecified), the mortality was highest among underweights and those considerably overweight. This trend showed much variation with age. *Bronchopneumonia* caused a high mortality among young overweights. For *influenza,* the mortality was high, at all ages combined, among those 15–24 per cent. underweight. This was most noticeable at ages under 40, especially in the later insurance years. After 40 the death rate from influenza was highest among the overweights, but the excess was relatively small. The mortality from *pleurisy* among underweights was double that for the experience as a whole.

For the *chronic cardiovascular and renal conditions,* there was a fairly steady progression of the ratios from the lowest levels in the underweight groups to the highest in the overweight groups. This trend became more pronounced with increasing duration of insurance, but, surprisingly enough, showed up most clearly in the younger age groups at issue. This trend existed in each division of the cardiovascular and renal group, but was most marked for *organic heart disease. Acute heart and kidney disease,* on the other hand, tended to be high among underweights.

The mortality from *cancer* displayed a tendency to rise with increasing weight, although this trend was less marked than in the preceding groups. This relationship was most marked at the older ages, especially for *cancer of the female genital organs* and of the *intestines.* There was no distinct trend according to build for *cancer of the breast, stomach, liver* and *gall bladder.*

Diabetes showed the typical correlation between weight and mortality, far more distinctly than did most other causes. At all ages combined, the death rate among women 15 to 34 per cent. overweight was 62 per cent. above the average and among women 5 to 14 per cent. overweight, 22 per cent. above the average. The trend became clearer with increasing duration of insurance. The 15 to 34 per cent. overweight group had a mortality almost double the average in the sixth and later insurance years. These tendencies were more marked at ages past 40 than before that age.

The most striking differences in mortality according to build were found in *diseases of the gall bladder and biliary passages.* Here an unmistakable progression of mortality from a low point among underweights to a high point among more extreme overweights was disclosed. Women 25 to 44 per cent. overweight had a mortality from these conditions four and one-third times that of the average for the whole experience, and over ten times that of underweights. This trend was somewhat more distinct at the younger ages at issue. It was little affected by duration of insurance. It was somewhat more marked among cases with stones than among those with inflammatory conditions.

In the other surgical conditions, there was some variation in the picture. The mortality from *appendicitis* was slightly higher among overweights than among those of slighter build. There was no difference according to build in the mortality from *ovarian or uterine tumors,* nor from *other pelvic conditions.*

With regard to *puerperal conditions,* the results cannot be considered conclusive for reasons already pointed out. If, however, as we believe, there is no great difference in the proportion of married women in the various build groups and in their fertility, some weight may be given to the mortality from these conditions in the study. They show high death rates, particularly at ages under 30 among the more obese women. The mortality was higher than average in all the overweight groups at these ages. In the age group 30 to 39, in which the number of deaths from these conditions was much smaller, there was no distinct tendency according to build. With regard to specific conditions, *puerperal septicemia* followed the trend for puerperal conditions as a whole.

Puerperal albuminuria seemed to be high, both among the very thin women and among those much overweight. This was most marked at age groups under 30 at issue.

On the whole, the mortality from *accidents* did not show any great variation according to weight, although with increasing duration of insurance there seemed to be a tendency toward a high mortality among the more obese women. The mortality from accidents is relatively unimportant among women, and it did not seem worthwhile to make a detailed analysis according to the type of accident. For *pedestrian automobile accidents,* however, although the number was small, there was a much higher mortality among overweights than among those of slighter build. It is likely that this arises partly from the lack of agility and alertness on the part of stouter women.

Suicide showed no distinct variation according to build. Of the several minor causes studied, negative results, according to build, were obtained with regard to *syphilis, acute rheumatic fever* and *cirrhosis of the liver.* Underweights had a relatively high mortality from *pernicious anemia.* The mortality from *toxic goiter* was significantly below average among overweights, but there was no distinct difference between underweight and average weight women. *Ulcer of the stomach and duodenum,* as a group, had its lowest mortality among underweights, but this may reflect medical selection. Ulcer of the stomach separately was too infrequent to show any distinct tendency. *Intestinal obstruction* was low in underweights and somewhat high in average and overweight women.

SUMMARY AND CONCLUSIONS

1. The ungraduated data on build of women, as reported in 329,627 Standard policies issued by the Metropolitan Life Insurance Company, during 1922-1934 are presented in tabular form. These tables give the mean heights of these women at various ages and the mean and median weights and the standard deviations around the means at each inch of height from 4′8″ to 6′0″ in age classes. The total range of height was from 4′0″ to 6′6″. The

extremely short and tall women were excluded from the mortality study.

2. The mean heights increased steadily with age to a maximum between 40 and 49. The average height among adult women was approximately 5′4¼″. There is no evidence in this Standard material of an increase in the average height of women in the population in recent decades.

3. The average weights increased both with advancing age and increasing height. The increments of weight with height were fairly regular. On the other hand, the increments of weight with age were not regular. There was a definite tendency for a diminishing rate of increase with age during adult life and, past 50, the average weights became stable.

4. Appreciable differences exist between these averages and those of the standard (Medico-Actuarial) height-weight table. That table overstated the averages at ages under 25 and understated them at ages past 25.

5. Analysis of the mortality according to weight classes showed the same trends as the earlier studies on male lives, namely, relatively high mortalities among young underweights, distinctly high mortalities among older overweights and the most favorable build with regard to mortality shifting from moderate overweight at the younger ages to moderate underweight at the older ages. There is some evidence that the excess mortalities are not as great in females as in males.

6. The mortality of women of short height has been distinctly above the average. In general, tall women have had the best mortality except at ages under 30. The biological significance of this finding is questionable. It may be related to social and racial factors and may be temporary.

7. Analysis of the mortality from specific causes of death, according to build, revealed certain definite characteristics. Most of the respiratory diseases were excessively frequent among younger women markedly underweight, but obese women also suffered high death rates from some of these conditions. Among overweight women high death rates prevailed for all of the cardiovascular-renal conditions, diabetes, gall bladder disease, cancer

and puerperal conditions. Generally, the greater the degree of overweight, the higher was the mortality from these diseases. The mortality from accidental causes, as a whole, and from suicide showed no marked variation in mortality according to weight.

This study of our experience on women has yielded important new anthropometric and mortality data. It must be emphasized that this is a preliminary report, based, as it is, on Standard issues only. Some of our findings may be modified when the Substandard data, which we are now analyzing, are ready. In the main, however, the general picture given by these Standard risks is a consistent one.

Our anthropometric data, we believe, indicate the need of some revision of the standard height-weight table. That table is too smooth and its very smoothness disregards what are probably fundamental changes in weight according to age during adult life. A complete statement in this regard must wait until we have the facts for the Substandard because this group contains the data on the extreme underweights and overweights. Incidentally, it is our judgment that median weights are probably better than mean weights because the latter are unduly influenced by the extreme overweight cases.

This mortality experience confirms generally the assumption that has been made in the insurance business with regard to build of women, namely, that they present a situation similar to that disclosed by the studies of the influence of build on mortality among men. There is some evidence, however, that the penalties that go with underweight at the younger ages and overweight at the older ages are not as severe as in men. This conclusion, however, is stated only tentatively. We must have the results on our Substandard issues before we can be certain of this conclusion. Medical selection of the overweights given Standard insurance may account for the relatively favorable mortality of female overweights as compared with males.

25717

END OF
TITLE